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KHM ENVIRONMENTAL MANAGEMENT, INC.

November 30, 2000
Project B60-01C

Mr. Don Pettit
Oregon Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201

RE: Remedial Investigation Proposal
GATX Linnton Terminal
Portland, Oregon

Dear Mr. Pettit:

On behalf of GATX Terminals Corporation (GATX), KHM Environmental Management, Inc. (KHM) has prepared this Remedial Investigation (RI) Proposal in accordance with the Oregon Department of Environmental Quality (DEQ) requirements presented in Consent Order No. WPMVC-WMCVC-NWR-00-17, dated May 24, 2000. The GATX site is located at 11400 NW St. Helens Road in Portland, Oregon. The RI Proposal presents the framework for the subsequent RI Work Plan. This framework will include a conceptual site model (CSM), objectives of the RI activities, and a proposed schedule of RI activities.

FACILITY DESCRIPTION

The subject site is a GATX bulk fuel storage and distribution facility located in the northeast quarter of Section 3 Township 1 North, Range 1 West (Figure 1). The subject site lies between Northwest St. Helens Road to the west and the Willamette River to the east in Portland, Oregon (Figure 2). The site is approximately 15.97 acres, according to the Multnomah County Tax Assessor. The site is slightly sloped toward the Willamette River, with a steep embankment at the riverfront that is supported by wooden bulkhead retaining walls.

We understand that Associated Oil Company originally developed the facility in 1903 and storage tanks were constructed at the site in 1918. In 1937, Tidewater Oil Company bought the facility and tank capacity was approximately 272,000 barrels (11.4 million gallons) at that time. Tidewater added tanks in 1939 and 1955 to increase tank capacity to 482,000 barrels (20.2 million gallons). Phillips Petroleum purchased the terminal from

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PORTLAND, OREGON • 123 NE 3RD STREET, SUITE 300 • 97232 • PHONE: (503) 233-4068 • FAX: (503) 233-4917
SAN JOSE, CALIFORNIA • 6284 SAN IGNACIO AVENUE, SUITE E • 95119 • PHONE: (408) 224-4724 • FAX: (408) 224-4518
CROCKET, CALIFORNIA • 565 CLARK STREET • 94525 • PHONE: (510) 787-6756 • FAX: (510) 787-6756

Tidewater in 1966 and sold it to GATX Terminals Corporation in 1976. Many of the original tanks still remain in service.

The facility currently consists of 34 above-ground petroleum tanks and associated equipment (Figure 3). The tanks are connected via a piping system to the Olympic Pipeline, the Kinder-Morgan Pipeline (formerly Santa Fe Pacific Pipeline), truck and rail car loading racks, and the wharf used for transfer to and from barges and ships. Buildings on the site consist of four warehouses (designated as "A" through "D"), the boiler and pump house, an electrical house, a maintenance shop and an office which is connected to warehouse "A". Only the office, maintenance shop and part of warehouse "C" are used regularly, the remaining warehouse space appears to be rarely used. The northern one third of the facility is almost entirely paved with reinforced concrete, while most of the tank yards and remaining portions of the property are surfaced with gravel.

The GATX Linnton Terminal (Terminal) lies at the foot of the Tualatin Mountains, on a narrow strip of level to gently sloping land, west of the Willamette River. The community of Linnton is comprised primarily of mixed residential to heavy industrial properties and the properties adjacent to the Terminal have been used for heavy industry. Highway 30, the primary rail line to the northern Oregon Coast (Portland & Western RR), two major petroleum pipelines, and the Willamette River pass through the area. Properties to the north and south were formerly large-scale lumber milling facilities during 1930 through the mid-1980s; the southern property was also used as an adhesives plant between the late 1950s and the late 1980s. The property to the north is now vacant and the southern property is currently used for storage of large steel beams and sheet pilings.

PREVIOUS INVESTIGATIONS

During October 1991, the DEQ conducted a Preliminary Assessment (PA) of the GATX Terminal. This PA was conducted due to the detection of benzene and xylene concentrations on the adjacent property, the Linnton Planning Mill. These compounds were detected in groundwater collected from a monitoring well installed as part of a leaking underground storage tank investigation. The monitoring well was located 30 feet from the GATX property and was in the assumed up gradient direction of the leaking UST and down gradient of the GATX truck loading rack and vapor recovery system. Therefore, the DEQ wanted to investigate the possibility of the benzene-impacted groundwater migrating from the GATX facility. During this PA, records of several small releases along the riverfront associated with dock activities were identified. However, no records were found to indicate a large upland release. Based on only the detected benzene on the Linnton Planning Mill site and the long history of petroleum handling at the GATX facility, the DEQ required an Expanded Preliminary Assessment be conducted.

In September 1992, Pacific Northern Environmental prepared a brief report that was submitted to the DEQ. This brief report presented information suggesting that the benzene concentration detected on the Linnton Planning Mill property was due to operations at the mill. The letter also asked the DEQ to issue a "No Further Action" letter for the GATX site.

In March 1993, the DEQ reviewed existing documents on the GATX site and the Linnton Planning Mill site. The DEQ noted that the benzene concentrations were now below risked-based levels but requested further investigation at the GATX facility and assigned the site a medium priority.

In September 1993, the DEQ sent a letter to GATX informing them that the site had been re-categorized as a high priority site. GATX responded by submitting a request for the DEQ to reconsider the reclassification. There is no record that the DEQ responded to this request.

In response to the discovery of a leak in the diesel line near the northern approach to the marine dock and the occurrence of a sheen on the river, two environmental consulting firms were contracted to assess the extent of the release over a one year period. The leaking diesel line was used for refueling boats.

In July 1995, Emcon Northwest completed four soil borings as groundwater monitoring wells in the vicinity of the diesel release. Wells MW-1, MW-2, and MW-3 were constructed of four-inch PVC casing. Measurable thicknesses of separate-phase hydrocarbons (SPH) were reportedly observed in these three wells within five days of installation. MW-1 and MW-2 showed apparent product thicknesses of approximately nine feet. Well MW-4 was constructed as a two-inch PVC well situated upgradient of the release point. The work is described in an August 31, 1995, report titled: *"Subsurface Investigation at GATX Tank Storage Facility"*.

In October 1995, Agra Earth and Environmental (Agra) conducted field activities to further identify the extent of the diesel release at the GATX Terminal. Five Geoprobe borings were advanced around the four monitoring wells previously installed in the diesel release area. As an interim measure, SPH was hand bailed until November 20, 1995 when the automated system was installed. Approximately 213 gallons of SPH were recovered by hand bailing and approximately 100 gallons were recovered in the first two days of pumping with the automated system.

In the fall of 1997, the DEQ and the USEPA conducted an investigation of the sediments in a 5.6 mile stretch of the Willamette River known as the Portland Harbor. Five shallow sediment samples and one deeper composite sample were collected from sediments near the GATX Terminal. These sediments contained detectable levels of low molecular weight polynuclear aromatic hydrocarbons (PAHs) and high molecular weight PAHs.

SITE ASSESSMENT - 1999

From September 13 through October 8, 1999, KHM performed an environmental investigation of the subsurface at the site. These activities included the completion of nine Cascade Probe borings, four hollow-stem auger borings, five hand auger borings, installation of four groundwater-monitoring wells, installation of five piezometers, and the collection of eight sediment samples from four locations. The location of each of these sampling points were selected based upon past site practices or the need for a data point in an area. Project findings are summarized below:

- Soil encountered during the site investigation consisted primarily of sand underlain by an undulating silt layer at depths ranging from just below the pavement surface to approximately 22 feet below grade. The total depths of the soil borings ranged from approximately 10.5 feet to 26.5 feet below grade.

- Groundwater was encountered in the soil borings at depths of approximately 10 feet to 20 feet. As anticipated, the groundwater flow direction appears to be toward the river.

- Liquid-phase hydrocarbons were observed in Monitoring Wells MW-1 through MW-4. The liquid-phase hydrocarbon thickness ranged from 0.21 feet in MW-4 to 2.06 feet in MW-2.

SOIL

A total of 32 soil samples were collected and submitted to the laboratory for analysis. Constituents analyzed in each sample was based on location of the sample collected.

Concentrations of total petroleum hydrocarbons (TPH) as gasoline were identified in 17 of the 24 soil samples analyzed for this constituent. The maximum detected concentration was 3,930 mg/kg from Sample P-4(10). Concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) constituents were detected in 8 of the 23 soil samples analyzed for BTEX compounds. The maximum detected benzene concentration was 26.9 mg/kg from Sample P-4(10).

Concentrations of TPH as diesel were detected in 16 of the 24 soil samples analyzed for this constituent. The maximum detected concentration was 9,190 mg/kg from Sample P-4(10). Concentrations of TPH as oil were detected in 10 of the 24 soil samples analyzed. The maximum detected concentration was 5,740 mg/kg from Sample MW-7(3.5).

Concentrations of PAH constituents were detected in 19 of the 24 soil samples analyzed for PAHs. The detected concentrations ranged from 6.72 µg/kg of benzo (a) anthracene in Sample SP-4(18) to 34,300 µg/kg of naphthalene in Sample P-4(10).

Fourteen soil samples collected from near the ground surface were analyzed for the presence of 10 RCRA metals. Each sample contained detectable levels of one or more metal. Detected concentrations ranged from 0.116 mg/kg (mercury) in Sample P-3(1.5) to 1,470 mg/kg (lead) in Sample SP-9(0.5).

SEDIMENT

Eight sediment samples were collected for chemical and physical analyses from four sampling locations. Pesticides were detected in 3 of the 8 sediment samples. The pesticides detected were 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT. The maximum concentration detected was 32.0 µg/kg (DDD). Two of these three sediment samples also contained detectable concentrations of the PCB constituent Aroclor 1254. The maximum concentration detected was 194 µg/kg.

Five of the eight sediment samples contained detectable levels of SVOCs. All SVOCs detected were PAH compounds. The maximum detected concentration was 4.21 mg/kg (pyrene). No VOCs were detected in any of the eight sediment samples.

Total metal concentrations were detected in each of the eight sediment samples. The detected concentrations ranged from 0.105 mg/kg (mercury) to 197 mg/kg (barium).

GROUNDWATER

Groundwater was sampled from five locations (MW-5, MW-7, MW-8, SP-2, and SP-3). Samples were not collected from Wells MW-1 through MW-4 due to the presence of liquid-phase hydrocarbons.

Five groundwater samples were analyzed for BTEX compounds. BTEX constituents were detected in three of the samples (MW-8, SP-2, and SP-3). Benzene concentrations ranged from 9.66 µg/L in Sample MW-8 to 18.9 µg/L in Sample SP-2.

Four groundwater samples were analyzed for PAHs. Two of the four samples (MW-5 and SP-2) contained detectable levels of PAH constituents. The concentrations ranged from 0.120 µg/L (phenanthrene) to 19.2 µg/L (phenanthrene).

Three groundwater samples (MW-5, MW-7, and MW-8) were analyzed for volatile organic compounds (VOCs). One sample contained detectable levels of VOCs. Constituent concentrations ranged from 1.47 µg/L of o-xylene to 50.9 µg/L of naphthalene.

Dissolved metals were detected in each of the five groundwater samples analyzed. The detectable levels ranged from 0.00110 mg/L of chromium in Sample MW-5 and 0.0947 mg/L of barium in Sample MW-5.

CONCEPTUAL SITE MODEL

The conceptual site model (CSM) presents the current understanding of the primary potential sources of contaminants in soil and groundwater beneath the facility, primary potential release mechanisms, migration pathways, and potential human and ecological receptors.

The Terminal lies at the foot of the Tualatin Mountains (Portland Hills) on the west bank of the Willamette River. Soils in the area are reported to be up to 60 feet thick, and thin towards the west. Fine to medium sand fill covers the native alluvial floodplain deposits, which are comprised of sandy silts and silty sands. Fractured Columbia River Basalt Group underlies the alluvium. Outcrops of the Columbia River Basalt Group occur along Highway 30 (St. Helens Road) near the facility. Aerial photos indicate that a southern portion of the site was filled along the Willamette River between 1941 and the early 1950's.

PRIMARY POTENTIAL SOURCES OF CONTAMINANTS

Petroleum storage and processing operations at the Linnton facility began in 1903. Thirty-four above ground storage tanks are located in the central to southeastern portion of the property. These tanks have a combined capacity of approximately 482,000 barrels (20.2 million gallons). In addition to the tanks, there are extensive above and below ground piping, a truck loading rack, and rail and ship loading and unloading facilities.

Over the history of the Linnton Terminal, the terminal has carried a wide range of bulk petroleum distillates including gasoline, white gas, kerosene, several grades of diesel fuel, lube oils, industrial oils and greases, and solvents. Currently, the principal products stored at the facility are diesel and gasoline. The primary potential source of contaminants detected in the soil and groundwater beneath the terminal are generally related to the storage and transfer of petroleum hydrocarbons.

PRIMARY POTENTIAL RELEASE MECHANISMS

Surface spills and line leaks appear to be the primary release mechanisms for petroleum hydrocarbons and other chemicals to soil and groundwater. The releases appear to have been associated with discharges from above ground tanks as the result of spillage, and overfilling, railroad tank car spillage, and pipeline failures.

POTENTIAL MIGRATION PATHWAYS

Migration pathways include movement of released chemicals through air, soil, groundwater, and surface water. As surface spills spread out onto the ground surface, a portion of the release would be volatilized into the air. This component of a release would be dispersed by prevailing winds. A surface spill could penetrate fairly rapidly into the predominantly gravelly surface soil and eventually into the silty sand to sandy silt vadose zone. Released chemicals can move downward through the soil column leaving behind a residual coating on soil particles. Chemicals have moved into the groundwater at depths ranging from 10 to 20 feet below ground surface. The chemicals typically dissolve into the groundwater and would move with the natural flow toward the Willamette River. Historically, petroleum hydrocarbon seeps have been observed in a few locations along the banks of the river.

Air

Chemical releases are partitioned into the vapor phase by volatilization. A portion of surface releases would be volatilized immediately into the air upon exposure. In the site vicinity, prevailing winds are from the north-northwest throughout the year. Within a relatively short period of time, the initial volatile portion of a surface release would be dissipated. Chemicals would subsequently move downward into soil and groundwater. Volatilization can continue from soil and groundwater. Chemicals in the vapor phase move upward from soil and groundwater and are released to the atmosphere and/or into any nearby enclosed surface structures. Soil and groundwater vapors entering the atmosphere are dissipated by prevailing winds.

The potential for migration of spilled chemicals through dust erosion is limited. Almost the entire facility is paved or covered with gravel and above ground tanks.

Soil

Soils encountered during previous assessments consisted primarily of sand, silty sand, and sandy silt overlain with either a thin layer of crushed rock or reinforced concrete. Interpretation of soil stratigraphy indicates an undulating silt layer overlain by a sandy fill layer. Soil beneath the southeast portion of the facility consists of fill apparently generated from dredging of the adjacent Willamette River. The fill is composed primarily of fine to medium grained sand and silty sand.

Surface spills and releases from buried tanks and pipelines would move downward through soil. The thickness of soil penetrated depends on the quantity of the release, soil permeability, and the viscosity of the liquid. Over time, downward migration of contaminants would continue with infiltration of rainwater and surface runoff which could re-mobilize soluble portions of the release. The average annual precipitation in Portland is approximately 38 inches. The downward migration of contaminants would terminate at the upper surface of the water table capillary fringe. Fluctuation of groundwater levels can produce a smear-zone of soils with elevated concentrations of released chemicals.

Migration through soil to groundwater is considered a potential pathway for petroleum hydrocarbons. However, the movement of soil itself is not considered a viable pathway. The ability for impacted surface soils to move significant distances by erosion and water transport is very limited. Areas around above ground storage tanks and loading/unloading areas are bermed or contained by perimeter walls. Water generated from the tank farm, truck loading and unloading, former drum areas, and other potential spill areas is captured in bermed/walled areas and treated by an oil/water separator. Storm water runoff is collected from roof drains and non-spill related areas into catch basins.

Groundwater

During KHM's investigation, groundwater was encountered at depths ranging from 7 to 20 feet below grade. The groundwater gradient direction is generally eastward, toward the Willamette River. It appears that the wooden bulkhead along the riverfront acts as a partial hydraulic barrier and any liquid-phase hydrocarbons that may be present are retained behind the bulkhead.

Spilled and released chemicals would move downward until encountering shallow groundwater. Where large volumes of petroleum hydrocarbons are released, SPH can potentially form a lens on the top of the groundwater. Soluble portions of releases could dissolve into the groundwater and would migrate eastward toward the Willamette River.

The horizontal migration of contaminants in groundwater may have been facilitated by preferential pathways in the subsurface. There are several stormwater outfalls on, and adjacent to, the Terminal that may serve as conduits for groundwater migration. These possible conduits include two on-site stormwater collection systems, two former stormwater outfalls located on adjacent property immediately north and south of the terminal, and another outfall that drains property upland.

Surface Water

Areas around above ground storage tanks and loading/unloading areas are bermed or contained by perimeter walls. Water generated from the tank farm, truck loading and unloading, former drum areas, and other potential spill areas is captured in bermed/walled areas and treated by an oil/water separator. Storm water runoff is collected from roof drains and non-spill related areas into catch basins. Since surface water is contained on site by and surface run-off is treated on site before being discharged to the Willamette River, this is not a primary migratory pathway.

POTENTIAL HUMAN RECEPTORS

Potential on-site human receptors include outdoor site workers, indoor site workers (i.e. office workers), trench workers, visitors, and trespassers. On-site workers may contact released or spilled chemicals through the following actions:

- Incidental ingestion of impacted soil;
- Dermal contact with surface contaminated soil;
- Dermal contact with subsurface soils and groundwater (trench workers only);
- Inhalation of dust particles; and
- Inhalation of soil vapors from impacted soil and/or groundwater.

Off-site potential human receptors include residents, passer-bys, and recreational river users. The primary exposure to spilled/released chemicals would most likely be through wind transport of soil particulates and/or vapor.

POTENTIAL ECOLOGICAL RECEPTORS

Potential ecological receptors include both terrestrial and aquatic receptors. Due to the industrial nature of the facility and the surrounding area, there is not significant terrestrial habitat at the site.

There is aquatic habitat in the Willamette River located adjacent to the site. Aquatic receptors include fish, mammals, and birds that populate habitats along the riverbanks.

OBJECTIVES OF RI ACTIVITIES

Per OAR 340-122-080, the goal of a remedial investigation (RI) is to collect information to determine the need for remedial action. The RI activities will collect the additional data needed to further interpret subsurface conditions, evaluate the potential human health and ecological risk associated with these conditions, and to evaluate characteristics relevant to identification of potential hot spots of contamination. The RI Work Plan will present site-specific tasks designed to complete the data collection needed to fulfill the above objective. These tasks will include such items as:

- Research available literature to obtain information needed to determine the likely beneficial uses of water in the locality of the facility;
- Collect data needed to support the determination of the locality of the facility;

- Perform a supplemental soil assessment to further identify and characterize any impacted soil conditions;

- Perform a supplemental groundwater assessment to further identify and characterize any impacted groundwater and to adequately evaluate hydrogeologic conditions;

- Characterize all release mechanisms sufficiently to be able to evaluate source control measures;

- Collect data needed to prepare an Upland Risk Assessment; and

- Prepare a determination of likely future land use.

Since all information derived from previous investigations will be incorporated into the RI, the Site Characterization Plan will be limited in scope to address data gaps in existing assessment data. Characterization of sediment contamination shall not be part of the RI as this is anticipated to be completed through the Portland Harbor Sediment RI.

SCHEDULE OF RI ACTIVITIES

Tasks completed as part of the RI shall proceed in accordance with the schedule presented in the Consent Order. The schedule is as follows:

TASK	SCHEDULE
DEQ Review and Comment on this document:	Within 30 days of receipt of the RI Proposal
Draft RI Work Plan:	Within 45 days of receipt of DEQ comments on RI Proposal
DEQ Comments on Draft RI Work Plan:	Within 30 days of receipt of Draft Work Plan
Final RI Work Plan:	Within 30 days of receipt of DEQ comments on Draft RI Work Plan
Initiation of RI and SCM:	Specified in Final RI Work Plan.

This schedule does not include any additional time for iterative comments between GATX and DEQ. If additional rounds of comments or review becomes necessary, this schedule will be adjusted accordingly.

If you need further information or have any questions, please call (503) 233-4068.

Sincerely,
KHM Environmental Management, Inc.

Kelly A Kline

Kelly A. Kline, RG
Senior Geologist

Kelly A Kline

Ward Crell, RG for
Principal Geologist

REGISTERED PROFESSIONAL
OREGON
KELLY A. KLINE
Kelly A Kline
G1393
GEOLOGIST

Cc: Eric Conard, GATX Terminals Corporation

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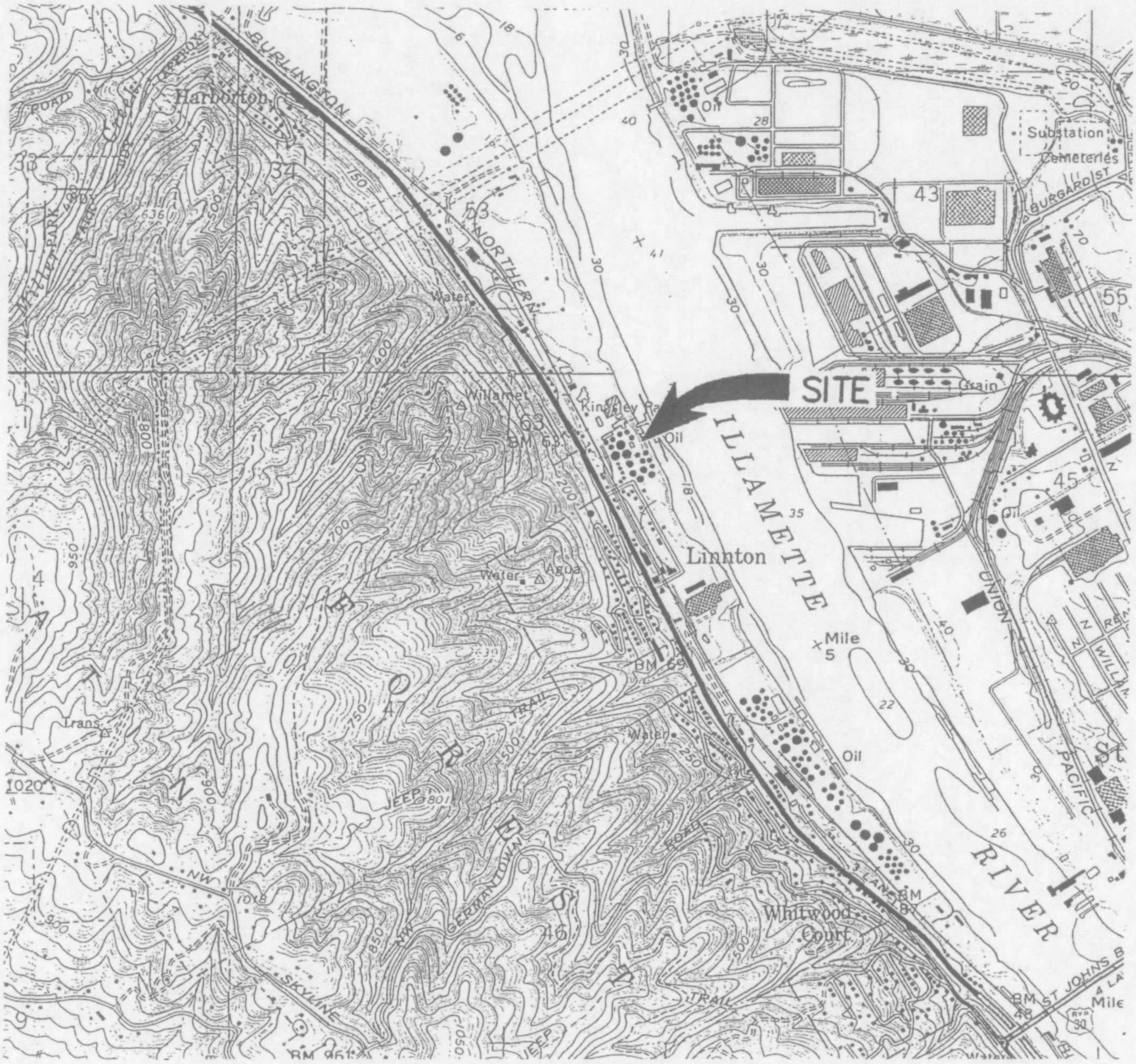

REFERENCES

USGS 7.5 Minute Topographic Map
Linnton, Oregon, 1961
Photorevised 1984

SCALE: 1:25,000

KHM ENVIRONMENTAL MANAGEMENT INC.	TITLE Site Location Map		
	GATX Terminals Corporation Linnton Terminal 11400 NW St. Helens Road Portland, Oregon		
	DATE 11/16/99	PROJECT B30-01A	FIGURE 1

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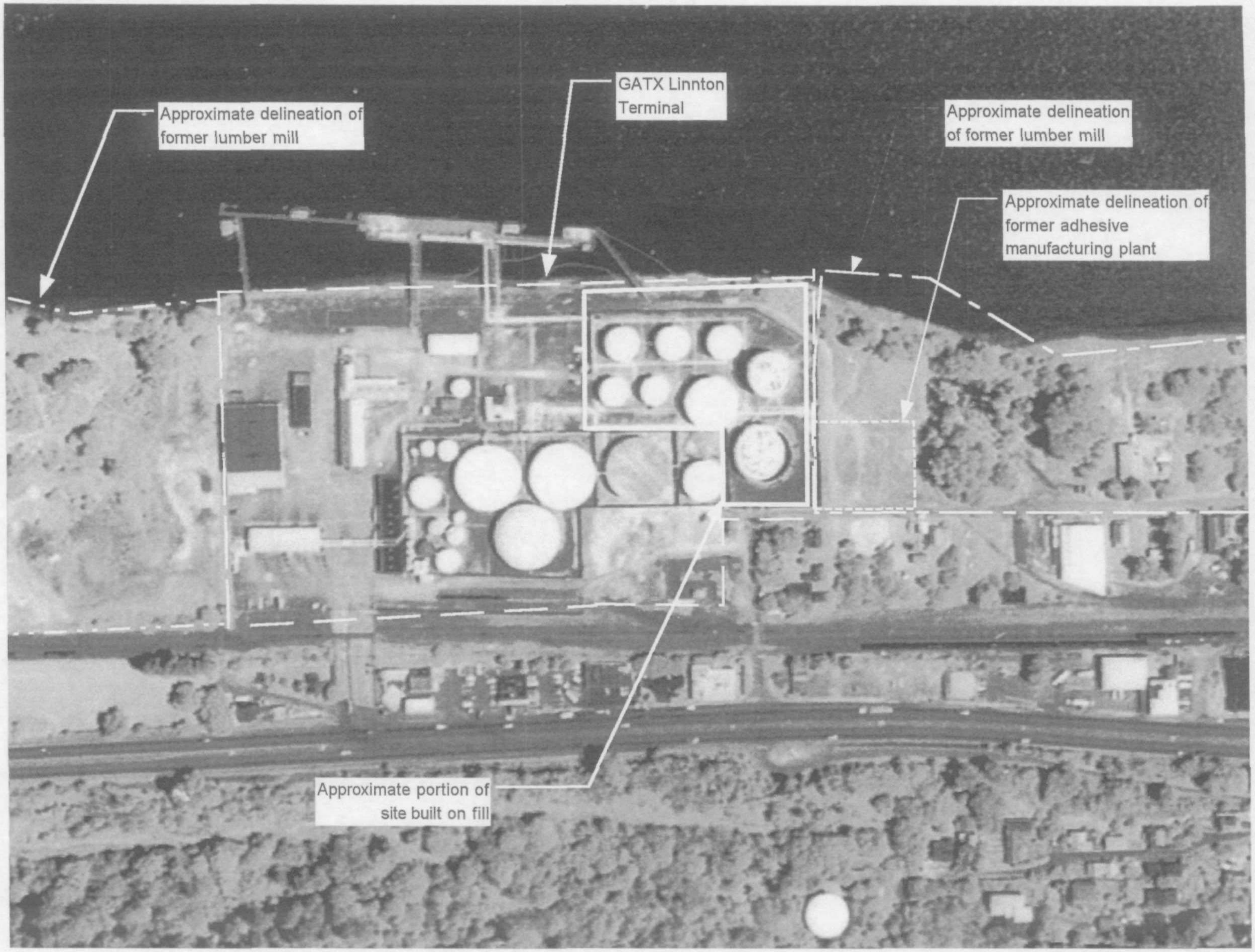

REFERENCES

Photograph provided by U.S. Army Corps of Engineers,
Date of photography: 1995

Approximate scale: 1 inch = 300 feet

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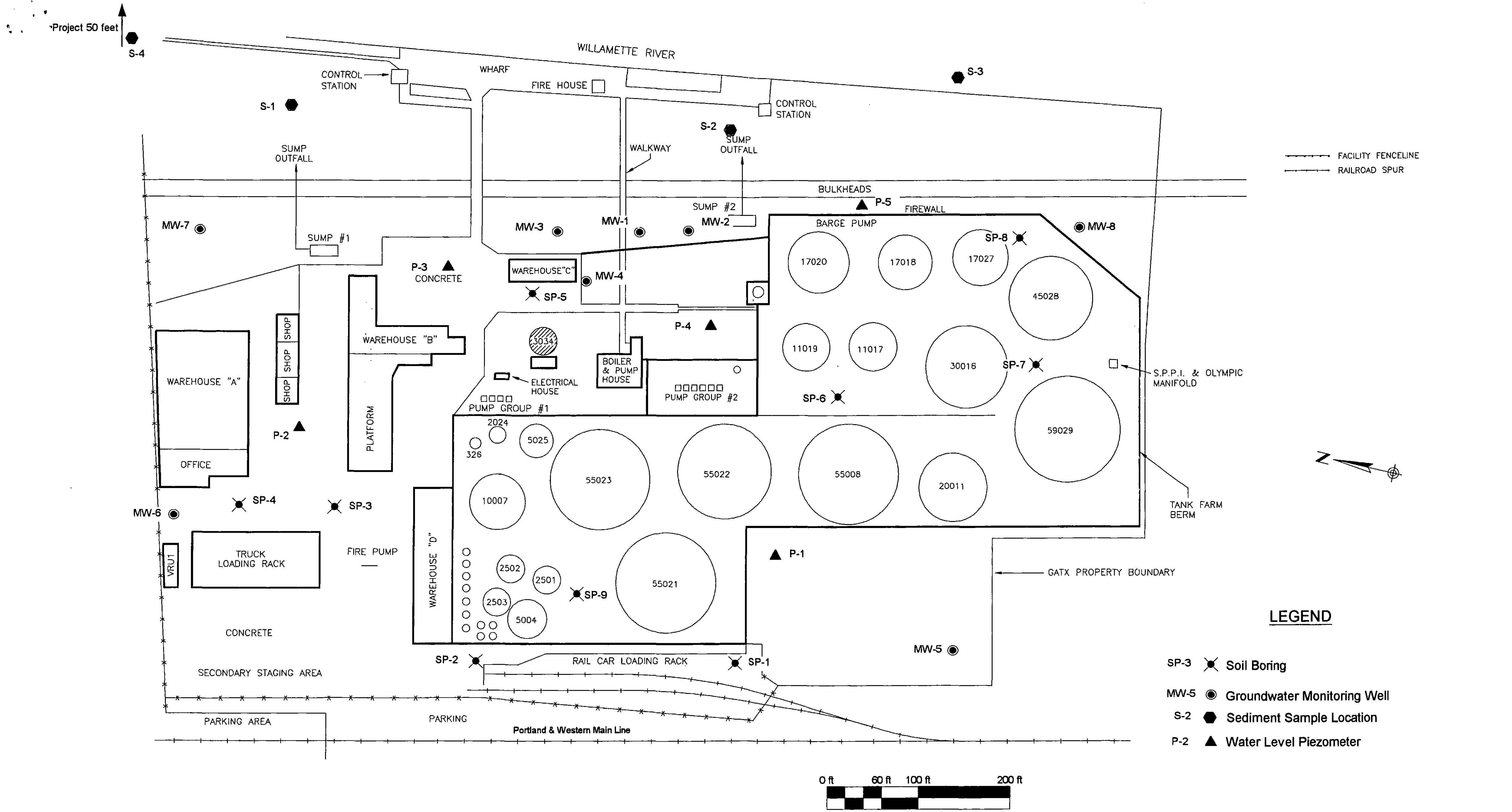
MANAGEMENT
INC.

TITLE
Extended Site Map

GATX Terminals Corporation
Linnton Terminal
11400 NW St. Helens Road
Portland, Oregon

DATE 11/22/99 | PROJECT B30-01A | FIGURE 2



KHM ENVIRONMENTAL MANAGEMENT INC.	Site Map		
	GATX Terminals Corporation Linnton Terminal 11400 North West St Helens Road Portland, Oregon		
	DATE 10/26/99	PROJECT B30-01A	FIGURE 3